

EXHIBIT 2



Civil & Mining Engineering
Tunnel Engineering & Construction Management
Rapid Excavation/Support Systems
Active/Abandoned Mine Subsidence
Geotechnical Instrumentation
Structural Monitoring
Blast Optimization / Vibration Monitoring
Mine & Quarry Permitting
Material Science / Laboratory Testing

Wednesday, July 18, 2012

Mr. Tait McCutchan
Project Manager
Malcolm Drilling Company, Inc.
8701 S 192nd Street
Kent, WA 98031
(sent via e-mail to TMCCUTCHAN@malcolmdrilling.com)

Re: CRC Drilled Shaft Test Program BS-1 Shaft Casing Damage

Dear Mr. McCutchan

This letter presents our analysis of the casing damage that occurred while installing the BS-1 shaft for the Columbia River Crossing Shaft Test program on May 21, 2012 and responds to related comments by WSDOT.

We understand that MDCI was installing a 10-ft diameter casing on the above noted project when they encountered conditions at an approximate depth of 215-ft that damaged the casing. A claim was subsequently submitted through the Prime Contractor, Max J. Kuney on May 23 and reviewed by WSDOT on May 25 when the following comments were made:

1. *"Based on the May 24-25, 2012 field observations of the removed casing at Shaft BS-1 we are not ruling out the possibility of an obstruction, but at this time we do not believe an obstruction has been encountered. We would expect to see scraping on the outside of the casing if an obstruction was encountered and broken teeth at the bottom of the casing at the location of the damage. If your position is that an obstruction has been encountered based on field observations, please specifically describe the reasons you believe there is an obstruction."*
2. *"We suspect that the thickness of the casing may be a cause for the casing damage observed. A typical casing for a temporary oscillator is 3.13" for a 3-meter diameter casing based on Table 7.8.2-2 of the WSDOT Bridge Design manual, whereas the casing thickness used for shaft BS-1 is 1.25"."*

1. Obstruction Evaluation

We reviewed the drawing for BS-1, the boring log for CRC-HI-006, photographs of the damaged casing, and photographs of boulders that were retrieved from the bottom of the shaft after the casing damage occurred and have the following comments:

1. The ground at the elevation where the casing was damaged is represented as very dense, GRAVEL and COBBLES (Gravel Alluvium) located ten feet above the Troutdale contact – Log of Boring CRC-HI-006, Page 6 of 7.
2. Several boulders (see below) were removed from the base of the shaft. .
3. These boulders are specifically the obstruction that was encountered and these data are provided in response to WSDOT Comment 1 above.

Some of the Boulders Removed from Shaft BS-1



2. Casing Damage Evaluation

Several photographs are provided below which show the extent of damage at the



bottom of the permanent casing that was caused when oscillating at a depth of approximately 215-ft in Shaft BS-1.

In our opinion, this damage was caused when the oscillator rotated the casing backwards and forwards in the presence of the round boulders shown in the photographs on the previous page.

In one instance, the teeth appear to have penetrated a plane of weakness and created a fracture in one boulder. However, it is evident the other boulders rotated when

encountered by the casing teeth and became “wedged” beneath the casing and the outside very dense gravel wall causing the bending of the casing and teeth that is shown in the photographs.

The approximate 5-ft length of casing that was damaged corresponds to the distance



travelled backwards and forwards during an “oscillation” where the casing is rotated by about 25°.

3. Casing Thickness Evaluation

WSDOT's Comment 2 opines that the casing thickness used for Shaft BS-1 was thinner than required and that this may have been a cause of the casing failure. We have the following comments which suggest otherwise:

1. The data in Table 7.8.2-2 were provided to WSDOT by MDCI and are for a temporary reusable oscillator casing not permanent casing as was used for the BS-1 shaft. Furthermore, the 3.13" thickness referenced by WSDOT is a double wall casing (two concentric casings with an air gap in between).
2. The casing thickness was deliberately oversized by MDCI to 1.25". Typically, a 1" casing thickness would have been used for this project as evidenced by several, recently completed projects as well as the numerous used, 10-ft diameter lead casings that are stored at MDCI's Kent equipment yard.
3. MDCI recently completed the Willamette River Bridge which is located near the CRC and involved using the same method to construct shafts to 195-ft in similar ground using 1" thick permanent casings.
4. MDCI completed the Tanana River Bridge in Alaska installing 180ft long, 1" thick permanent casing in more difficult ground than indicated for CRC.
5. MDCI successfully completed installation of Shaft BS-1 using the 1.25" casing oscillating an additional 45-ft with 30-ft in the Troutdale formation.

We understand that WSDOT has also asserted that thicker than 1-in casings are typically used for horizontal pipe jacking. This assertion is also incorrect; however, it is useful to compare the forces associated with advancing a 10-ft diameter horizontal casing in similar materials (i.e., very dense gravel and cobbles) with the forces that were applied when casing CRC Test Shaft BS-1.

3.1. Jacking Force (Pipe Jacking) versus Vertical Crowding Force (Oscillator)

In the Seattle area, we have designed and built large diameter pipe jacked tunnels up to 120-ft long, jacking the casing while excavating material at the face, up to 12-ft in diameter using 1-in thick steel pipe. A 1,400 ton jacking frame is typically used and the jacking forces are typically in the range of 400 to 450 tons for a 120-ft long pipe jack. A thicker pipe is not necessary to accommodate these forces and would not be considered due to the increased welding time required.

The total jacking force required to advance a 250-ft long, 10-ft diameter casing would be 700 tons for a 1-in thick casing and 750 tons for a 1.25-in thick casing.

The crowding force applied to advance the casing for Shaft BS-1 would be 160 tons (1-in thick) to 200 tons (1.25-in thick) or the estimated weight of the 250-ft BS-1 shaft casing.

Three general observations can be made from this comparison:

1. Crowding forces used to advance vertical casings are significantly less than used to pipe jack horizontal casings of the same size.
2. The thickness of ten (10) foot diameter pipe used for pipe jacking is typically 1-in when jacking in very dense gravel and cobbles in the Puget Sound area.
3. There would be no reason to increase pipe thickness beyond 1-in based on the level of thrust and torque predicted to be required to drive casing through very dense gravel and cobbles.

3.2. Lateral Earth Pressure Resistance for Different Pipe Thicknesses

From an engineering perspective, a 1-in thick, 10-ft diameter casing fabricated from 36 ksi steel can accommodate a lateral earth pressure of 32 ksf using a safety factor of 2. This increases to 40 ksf for a 1.25-in thick casing using the same safety factor. By definition failure would not be expected to occur until the safety factor was equal to one (1) at which time pipe capacity would range from 64 ksf (1-in thickness) to 80 ksf (1.25-in thickness).

All of these calculated capacities exceed the horizontal loads that would be expected under normal Oscillator operation.

4. Conclusions

In our opinion, the rounded boulder obstruction(s) encountered by MDCl at a depth of 215-ft (approx.) are responsible for the casing damage that occurred on May 21, 2012 at Shaft BS-1. Furthermore, MDCl adopted a cautious approach when selecting the casing thickness when they increased the thickness by 25% over that previously used for similar projects in similar and more difficult ground conditions.

If you have any questions please don't hesitate to call us at 425-888-5425 or 425-471-0879.



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